REMARKS

Status of the Claims

Non-elected claims 26-44, 47-51, 57-104 and 109-207 have been canceled without prejudice. Additionally, claims 17, 20, 21 and 53-56 have been canceled. New claims 208-220 have been added. Accordingly, claims 1-16, 17-19, 22-25, 45, 46, 52, 105-108 and new claims 208-220 are pending.

Claim Rejections - 35 U.S.C. § 112

The Examiner has rejected claims 1-16, 17-19, 22-25, 45, 46 and 105-108 under 35 U.S.C. 112 second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. It is Applicant's understanding that claims 1-16, 17-19, 22-25, 45, 46 and 105-108 clearly set forth and distinctly claim the subject matter which Applicant regards as the invention. Additionally, it is Applicant's understanding that the claims are sufficient definite to insure that the scope of the claims is clear to the public and that they are informed of the boundaries of what constitute infringment of them. Applicant, therefore, respectfully request removal of the 35 U.S.C. 112 rejections of claims 1-16, 17-19, 22-25, 45, 46 and 105-108.

Claim Rejections - 35 U.S.C. §§ 102/103

The Examiner has rejected claims 1-11, 15, 18, 22-25 and 105-108 under 35 U.S.C. § 102(b) as being anticipated by Bergman et al. (US Patent 5,235,995). The Examiner has rejected claims 1-5, 8-15, 18, 19, and 22 under 35 U.S.C. § 102(a) as being anticipated by Busnaina (WO 0021692). The Examiner has rejected claims 6, 7, 45-46 and 105-108 under 35 U.S.C. § 103(a) as being unpatentable over Busnaina (WO 0021692) in view of Bergman et al. (US Patent 5,235,995), Akatsu et al. (US Patent 6,021,789) and Ohmi et al. (Advanced Wet Cleaning Technology for Next Generation FPD Manufacturing). The Examiner has rejected claims 16, 20, and 21under 35 U.S.C. § 103(a) as being unpatentable over Busnaina (WO 0021692).

In claims 1-16, 18, 19, 22-25, 45-46 and 105-108, Applicant teaches and claims an apparatus which applies a megasonic energy to the non-device side (backside) of a wafer while cleaning solution is applied to the wafer device side. The megasonic waves travel through the wafer backside and act on the cleaning solution applied to the wafer device side (frontside) to clean the wafer device side. By applying acoustic waves to the non-device side (backside) of the wafer, the acoustic waves first strike the wafer non-device side wherein no devices exist that could be damaged by the full force of the acoustic energy. In this way, fragile thin film features, such as polysilicon lines, formed on the device side are not damaged by the full force of the acoustic energy which impacts the wafer non-device side (backside). After the waves travel through the wafer where they are dampened there is still sufficient energy to provide cavitation in the cleaning solution on the wafer frontside side and provide optimal cleaning without damaging the fragile devices on the wafer frontside. Applicant does not understand any of the cited references to teach or describe an apparatus which applies megasonic energy to the wafer non-device side as claimed by Applicant.

It is Applicant's understand that Bergman et al. describes a processing machine 10 which includes a processing head 12 which includes a wafer holder 30 which holds the wafer processing surface facing down towards a pool 40 (Col. 8, lines 30-33). An ultrasonic agitator 75 is applied to the pool 40 to agitate and enhance vapor phase formation (Col. 9, lines 5-10). The vapor phase is then presented for contacting and etching the processed surface of the wafer (Col. 9, lines 32-33). As is well known in the semiconductor art, the process side of a wafer is the device side. As such, Bergman et al. clearly describes applying acoustic energy towards the wafer device side and not the wafer backside as claimed by Applicant.

It is Applicant's understanding that Busnaina also fails to teach applying megasonics energy to the non-device side (backside) of a wafer. Busnaina describes a single wafer megasonics cleaning apparatus 200 such as illustrated in Figures 2 and 3. The apparatus includes a container 205 for holding a single wafer 90 to be cleaned and for holding the liquid cleaning medium (page 8, lines 15-16). A megasonics transducer 210 is disposed to face the surface of the single wafer to be cleaned. The megasonics energy is directed 270 from the megasonics transducer towards the surface of the single wafer 90 to be cleaned. As is well known in the art, the surface to be cleaned is the wafer device side (frontside) which is the surface upon which processes, such as deposition, etching and polishing have occurred. Accordingly, Busnaina also fails to teach applying acoustic energy to the non-device side of a wafer as claimed by Applicant.

Additionally, neither of the secondary references of Akatsu et al. or Ohmi et al. teach applying acoustic waves to the non-device side of a wafer. It is Applicant's understanding that Akatsu et al. describes an apparatus for removing unwanted material from the wafer chip surface (device side). Akatsu describes to hold the wafer so that the cleaning solution 28 can be applied between the chip surface (device side) and a linear array of megasonics

transducers. As such, it is Applicant's understanding that Akatsu applies megasonics energy to the wafer device side and not to the backside as claimed by Applicant.

It is Applicant's understanding that Ohmi describes an apparatus for cleaning liquid crystal displays (LCD) substrates. In Figures 2 and 4, Ohmi describes an apparatus wherein a cleaning solution is applied onto the upper surface (device side) of a substrate by an upper nozzle having an ultrasonic transducer. As shown in Figure 4, the back surface (non-device side) can be cleaned by a applying a cleaning solution through a lower nozzle which does not contain an ultrasonic transducer. Thus, Ohmi clearly describes an apparatus whereby acoustic energy is applied to the wafer frontside (device side) and not the backside (non-device side) as claimed by Applicant.

As such, each of the cited references fails to teach an apparatus which applies acoustic energy to the non-device side of a wafer. Accordingly, the combination of references cannot possible teach Applicant's claimed invention. Applicant, therefore, respectfully requests the removal of the 35 U.S.C. §§ 102 and 103 rejections of claims 1-16, 18, 19, 22-25, 45-46 and 105-108 and seeks an early allowance of these claims.